

ABSTRACT

A method and apparatus for voltage regulation uses, in one aspect, worst-case supply voltages specific to the process split of the integrated device at issue. In another aspect, a two-phase voltage regulation system and method identifies the characterization data pertinent to a family of integrated circuit devices in a first phase, and identifies an associated process split of a candidate integrated circuit device in a second phase. The characterization data from the first phase is then used to provide supply voltages that correspond to target frequencies of operation for the candidate device. In another aspect, a hybrid voltage regulator circuit includes an open loop circuit which automatically identifies the process split of the integrated circuit device and allows a regulator to modify supply voltage based on characterization data specific to that process split, and a closed loop circuit which fine-tunes the supply voltage. In one embodiment, the closed-loop circuit includes a critical path replica for providing estimated frequencies of operation necessary for a critical path in the integrated circuit device. A ring oscillator circuit may be used in one embodiment in the critical path and/or in the open loop circuit.